REMARKS

Applicants have carefully studied the references cited by the Examiner and the Examiner's comments relative thereto.

Claims 61-101 remain pending in the application.

Claims 1-60 and 102-151 have been cancelled.

Claims 91, 92, and 98 have been amended.

Support for the amended claims is found in the application as originally filed.

No new matter has been added.

Reconsideration of the present application in view of the amendments and remarks made herein is respectfully requested.

Claims 61, 63, 65, 67, 69-73, 77, 79-82, 86, 87, 89-92, 94-95, and 98-101 were rejected under 35 U.S.C. 103(a) as being unpatentable over Takeo (U.S. Patent No. 4,721,630) in view of Yamamoto (U.S. Patent No. 5,240,745) and either or both of Sugata (U.S. Patent No. 5,336,321) and Pearce (U.S. Patent No. 4,781,517). Claims 90-95 and 97-101 were rejected based on the same rationale as for Claims 61, 63, 65, 67, 69-73, 77, 79-82, 86, 87 and 89. Claims 74, 83 and 97 were rejected under 35 U.S.C. 103(a) as being unpatentable over Takeo, Yamamoto, Sugata and/or Pearce as applied to Claims 72, 81 and 91, and further in view of Thome (U.S. Patent No. 5,744,190). Claims 75, 88 and 96 were rejected under 35 U.S.C. 103(a) as being unpatentable over Takeo, Yamamoto, Pearce and Thome as applied to Claims 72, 81 and 91, and further in view of Cebola (U.S. Patent No. Patent 5,738,727). Claim 76 was rejected under 35 U.S.C. 103(a) as being unpatentable over Takeo, Yamamoto, Sugata, Pearce and Thome as applied to Claims 75 and 52, and further in view of Neikter (US Patent No. 5,296,029). Claims 64 and 85 were rejected under 35 U.S.C. 103(a) as being unpatentable over Takeo, Yamamoto and Pearce as applied to Claims 61 and 81, and further in view of Josefsson (U.S. Patent No. 5,766,355). Claims 66, and 68 are rejected under 35 U.S.C. 103(a) as being unpatentable over Takeo, Yamamoto and Pearce as applied to Claims 61 and 67, and further in view of Cebola. Claims 62, 84 and 93 were rejected under 35 U.S.C. 103(a) as being unpatentable over Takeo, Yamamoto, Pearce as applied to Claims 61 and 81, and further in view of Hohn et al. (U.S. Patent No. 4,896,274).

In response to the arguments in Applicants' Appeal Brief filed November 26, 2008, the Examiner stated:

> 13. Applicant's arguments filed 11/26/2008 have been fully considered but are moot in view of Sugata (US 5,336,321).
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> 14. Sugata discloses substantially the same subject matter as the Nuber reference, and is prior art.
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> 15. Additionally, applicant's appeal brief argued that Pierce does not disclose shoulder axes positioned below the frame. This is unpersuasive, since the entire robot of Pearce is below the frame, including the shoulder axes. Additionally, Sugata places a shoulder nearly parallel to the rail.
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> 16. Applicant's affidavits (by Rob Kuphal, Edward Minch, Douglas Bank, and Martin Rola) alleging commercial success are unpersuasive, because applicant does not show a nexus between the claimed invention and the commercial success. There is no evidence showing that the commercial success is due to a particular claim feature and not the result of. Additionally, the Scott Clifford and Paul Coppioli affidavits are unpersuasive because the affidavit suggests that the market success is related to unclaimed features that have been restricted out (the no-waist element)

Applicants' invention as recited in independent Claim 61 includes a modular apparatus (10) for painting surfaces of a vehicle body (43) moved along a path. The modular apparatus (10) includes two guide rails. At least one robot (16) is located on and movable along the length of each of said two guide rails. The guide rails include a pair of frame rails (11) located on opposite sides of and extending generally parallel to the path of movement of the vehicle body (43). The frame rails (11) are located above a plane of an upper surface (44) of the vehicle body (43) as the vehicle body (43) travels the path. The frame rails (11) are fixedly mounted on a rigid frame structure that prevents movement of one of said frame rails (11) relative to another of said frame rails (11). The at least one robot (16) includes a first and a second robot arm mounted on an associated one of each of said frame rails (11), each of said first and second robot arms being slidably movable along said associated frame rail (11) and having a shoulder axis (34) and an elbow axis (36) for movement only in a generally vertical plane transverse to the path of movement of the vehicle body (43). **The shoulder axes (34) are positioned below the associated frame rail (11).** A paint applicator (17) is mounted on each of the first and second robot arms for dispensing paint. Each of the first and second robot arms is sized to move the paint applicator (17) relative to the vehicle body (43) while the paint applicators (17) dispense

paint to cover the upper surface (44) and adjacent side surfaces (45) of the vehicle body (43) with the paint.

Applicants' present independent claims recite the patentable limitations of the invention as follows.

61. A modular apparatus for painting surfaces of a vehicle body moved along a path comprising:
a modular apparatus including two guide rails; and
at least one robot located on and movable along the length of each of said two guide rails;
said guide rails comprising a pair of frame rails located on opposite sides of and extending generally parallel to the path of movement of the vehicle body, said frame rails being located above a plane of an upper surface of the vehicle body as the vehicle body travels the path, said frame rails being fixedly mounted on a rigid frame structure that prevents movement of one of said frame rails relative to another of said frame rails;
said at least one robot comprising a first and a second robot arm mounted on an associated one of each of said frame rails, each of said first and second robot arms being slidably movable along said associated frame rail and having a shoulder axis and an elbow axis for movement only in a generally vertical plane transverse to the path of movement of the vehicle body, **said shoulder axes being positioned below said associated frame rail**; and
a paint applicator mounted on each of said first and second robot arms for dispensing paint whereby each of said first and second robot arms is sized to move said paint applicator relative to the vehicle body while said paint applicators dispense paint to cover the upper surface and adjacent side surfaces of the vehicle body with the paint.

72. A modular apparatus for painting a vehicle body having an upper surface and opposed side surfaces and being conveyed along a path comprising:
a modular apparatus including two guide rails; and
at least one robot located on and movable along the length of each of said two guide rails;
said guide rails comprising a pair of frame rails extending along opposite sides of and generally parallel to the path of conveyance of the vehicle body;
at least two legs attached to each said frame rail for supporting said frame rails above a plane of the upper surface of the vehicle body on the path;
at least one cross member fixedly connecting said frame rails together as a rigid frame structure that prevents movement of said frame rails, fixes said frame rails relative to one another and to said plane, and minimizes a width of said rigid frame structure relative to a width of the vehicle body;
said at least one robot comprising at least one robot arm located on an associated one of each of said frame rails, said at least one robot arm being movable along said associated frame rail generally parallel to the path and being pivoted **at a shoulder axis positioned below said associated frame rail**; and
a paint applicator mounted on each said at least one robot arm for applying paint to the vehicle body whereby each of said at least one robot arms pivots at said shoulder in a generally vertical plane to permit each of said at least one robot arms to reach said paint applicator to all paintable areas on the upper surface and an adjacent one of the side surfaces of the vehicle body.

81. A modular apparatus for painting surfaces of a vehicle body moved along a path through a paint booth comprising:

a modular apparatus comprising at least one horizontally extending guide rail; and

at least one robot arm including a controller mounted on said rail for travelling along said rail; wherein said guide rail comprises a pair of frame rails mounted on opposite sides of and extending generally parallel to the path of movement of the vehicle body through the paint booth, said frame rails being fixedly located above a plane of an upper surface of the vehicle body as the vehicle body travels the path; and

said at least one robot comprises a first and a second robot arm mounted on an associated one of each of said frame rails, each of said first and second robot arms being movable along said associated frame rail and having a shoulder axis and an elbow axis for movement only in a generally vertical plane transverse to the path of movement of the vehicle body, **said shoulder axes being positioned below said associated frame rail**; and

a paint applicator mounted on each of said first and second robot arms for dispensing paint whereby said first and second robot arms are sized to move said paint applicators relative to the vehicle body while said paint applicators dispense paint to cover the upper surface and an adjacent side surface of the vehicle body with the paint;

wherein said control means is connected to each of said first and second robot arms for selectively dispensing the paint in a normal mode wherein different areas of the upper surface and the adjacent side surface are covered by said paint applicators of each of said first and second robot arms and a degraded mode wherein the upper surface and the adjacent side surface are covered by said paint applicator of one of said first and second robot arms.

(Emphasis added)

90. A modular apparatus for painting surfaces of a vehicle body moved along a path comprising:

a modular system including two guide rails; and

at least one robot located on and movable along the length of each of said two guide rails; said guide rails further comprising a pair of frame rails located on opposite sides of and extending generally parallel to the path of movement of the vehicle body, said frame rails being elevated above a plane of an upper surface of the vehicle body as the vehicle body travels the path, said frame rails being mounted on a fixed rigid frame structure that prevents movement of one of said frame rails relative to another of said frame rails, and prevents movement of said frame rails relative to said plane; and

a first and a second robot arm mounted on an associated one of each of said frame rails, each of said first and second robot arms having a carriage movable along an associated one of said frame rails, first and second arm links, and mounting means for mounting a paint applicator at an end of said second arm link, three parallel axes of movement including a first linear axis wherein said carriages move along said associated frame rails, **a second rotational axis located below said first linear axis for rotating said first arm link relative to said carriage** and a third rotational axis spatially separated from said second rotational axis by said first arm link for rotating said second arm link relative to said first arm link whereby movement of a paint applicator attached to said mounting means is restricted to a generally vertical plane transverse to the path of movement of the vehicle body and movement along the path of movement of the vehicle body;

said robot arms further comprising a paint applicator mounted on each of said first and second robot arms for dispensing paint whereby each of said first and second robot arms is sized to move said paint applicator relative to the vehicle body

while said paint applicators dispense paint to cover the upper surface and adjacent side surfaces of the vehicle body with the paint.

(Emphasis added)

91. A modular apparatus for processing an article moved along a path comprising:
a modular system including two guide rails; and
at least one robot located on and movable along the length of each of said two guide rails; said robot including a control system;
said robot having six axes of motion and being connected to said control system for controlling movement of said robot,
said modular system having a frame structure including first and second linear and parallel guide rails, a first carriage supported on said first guide rail and movable along a first of said six axes and a second carriage supported on said second guide rail and movable along a second of said six axes, a first arm link rotationally coupled at one end to said first carriage at a third of said six axes and rotationally coupled at another end to a second arm link at a fourth of said six axes, a third arm link rotationally coupled at one end to said second carriage at a fifth of said six axes and rotationally coupled at another end to a fourth arm link at a sixth of said six axes, **wherein said third and fifth axes are located below said first and second guide rails and above a top surface of the article**, and process tool mounting means supported at terminal ends of said second and fourth arm links, wherein said first and second guide rails are elevated above the article on opposite sides of the path and said six axes are parallel to the path.

(Emphasis added)

98. A robot for processing an article moved along a path comprising:
a modular system including two guide rails; and
at least one robot located on and movable along the length of each of said two guide rails; said robot including a control system conjoined with and movable with said robot; and
wherein said guide rails form a robot base including a frame structure having linear and parallel first and second guide rails;
a first carriage supported on said first guide rail and movable along a first axis;
a second carriage supported on said second guide rail and movable along a second axis;
a first link mechanism rotationally coupled to said first carriage at a third axis, **wherein the third axis is located below the first axis**;
a second link mechanism rotationally coupled to said second carriage at a fourth axis, **wherein the fourth axis is located below the second axis**; and
a process tool mounting means supported at terminal ends of said first and second link mechanisms, wherein said guide rails are fixed and said modular system is elevated above the article on opposite sides of the path.

(Emphasis added)

Takeo discloses a system including a conveyor (2), a first railway means (11), a second railway means (16) located beside and extending along the conveyor (2) on the same side as the first railway means (11). The first railway means (11) is disposed below a plane of a lower

surface of the vehicle body. (See FIG. 2). The Takeo et al. system further includes a pair of front and rear painting robots (5_1, 5_2) and a door opening and closing robot (15). Each of the painting robots (5_1, 5_2) is mounted on the first railway means (11) for displacement along the first railway means (11) on respective movable tables (12_1, 12_2). (Takeo at col. 6, lines 48-64). The door opening and closing robot (15) is mounted on the second railways means (16) for displacement along the second railway means (16). The second railway means (16) is also disposed below a plane of a lower surface of the vehicle body. (Takeo at col. 7, lines 3-12). Takeo does not teach or suggest "frame rails located above a plane of an upper surface of the vehicle body", "frame rails that are fixedly mounted on a rigid frame structure", and robots having "shoulder axes . . . positioned below the associated frame rail".

Yamamoto discloses a painting apparatus (500) that includes a second painting mechanism (520) having a pair of vertical mobile posts and an arm (572) movably mounted at its opposite ends on the posts. The arm (572) is also horizontally movable on a pair of second rails (518a, 518b). Paint spray guns (574a to 574i) are supported on the arm (572). The arm (572) may be moved to a location above a horizontal plane formed by an upper portion 532 of the vehicle body (522). (Yamamoto at col. 22, lines 51-68, col. 23, lines 1-36, and in FIGS. 15 and 16). Yamamoto does not teach or suggest "frame rails that are fixedly mounted on a rigid frame structure", and robots having "shoulder axes . . . positioned below the associated frame rail".

The Examiner cited both Pearce and Sugata as disclosing the concept of elevating a robot on frames, and placing a large portion of the robot underneath the frame. Pearce discloses a frame (21) having lateral members (22) and transverse members (23). A robot carriage (71) is moveable both laterally and transversely on the bridge (24) disposed on the lateral members (22). The robot carriage (71) includes a tool mounting bracket (114) that is below the bridge (24), and which is configured to hold and rotate a tool (116) about an "R" axis. The robot carriage may thereby work on an automobile (50) disposed underneath the frame on a track (51) and carriage (52), as the automobile (50) is carried along the track (51) under the bridge (24). (Pearce at col. 3, lines 36-46, col. 4, lines 22-53, and in FIGS. 2, 8 and 9). The tool mounting bracket (114) rotatable about the "R" axis of Pearce is used to rotate different tools (116). Although disposed below the bridge (24), the "R" axis is plainly not "a shoulder axis" of a robot as recited in Applicants' claims. Pearce does not teach or fairly suggest a pair of robots "having a shoulder

axis and an elbow axis for movement only in a generally vertical plane transverse to the path of movement of the vehicle body, said shoulder axes being positioned below said associated frame rail", as recited in the claims.

Sugata discloses a painting apparatus (41) having a framework (51) with two vertical posts (52) and a horizontal beam (53) extending therebetween. A workpiece (20) is conveyed under the beam (53). A pair of robots (71, 91) is disposed on a carriage (61) that moves along the beam (53). Each of robots has a first arm (71) connected to a base (72), a second arm (74), and a third arm (75). The location where the first arm (73) pivots about the base (72) (i.e., a shoulder axis) is disposed above the beam (53). Sugata clearly does not teach or suggest a pair of robots "having a shoulder axis and an elbow axis for movement only in a generally vertical plane transverse to the path of movement of the vehicle body, said shoulder axes being positioned below said associated frame rail" as recited in the Applicants' claims.

The Examiner further cited secondary references in relation to various dependent claim limitations. Thome was cited as a teaching to include a process controller within robot bodies. Cebola was cited as a teaching to make structural elements hollow or tubular for receiving cables and conduits. Neikter was cited as a teaching of a cross support having a gas permeable tubular element surrounding the cross support for generating a positive pressure. Josefsson was cited as a teaching of painting robots mounted inside of a paint booth.

The combined art of Takeo, Yamamoto, Pearce, Sugata and the various other secondary references does not teach or suggest all of the limitations of independent Claim 61, and claims depending directly or indirectly therefrom. In particular, the combined art does not teach or suggest "said at least one robot comprising a first and a second robot arm mounted on an associated one of each of said frame rails, each of said first and second robot arms being slidably movable along said associated frame rail and having a shoulder axis and an elbow axis for movement only in a generally vertical plane transverse to the path of movement of the vehicle body, said shoulder axes being positioned below said associated frame rail". Accordingly, Claims 61-71 are patentable over the cited art.

Independent Claims 72, 81, and 90, and claims depending directly or indirectly therefrom, further recite "said at least robot arm . . . being pivoted at a shoulder axis positioned below said associated frame rail", "said shoulder axes being positioned below said associated frame rail",

and "a second rotational axis located below said first linear axis for rotating said first arm link relative to said carriage", respectively. These limitations are substantially the same as the patentable limitations of independent Claim 61. Thus, Claims 72-90 should be allowed for the same reasons as stated hereinabove with respect to Claims 61-71.

Applicants' invention, as recited in amended independent Claim 91, includes a modular system including two guide rails, and at least one robot located on and movable along the length of each of said two guide rails. The robot includes a control system for controlling movement of said robot, and six axes of motion. The modular system further includes a frame structure with first and second linear and parallel guide rails. A first carriage is supported on the first guide rail and movable along a first of the six axes and a second carriage is supported on the second guide rail and movable along a second of the six axes. A first arm link is rotationally coupled at one end to the first carriage at a third of the six axes, and rotationally coupled at another end to a second arm link at a fourth of the six axes. A third arm link is rotationally coupled at one end to the second carriage at a fifth of the six axes, and rotationally coupled at another end to a fourth arm link at a sixth of the six axes. The third and fifth axes are located below the first and second guide rails and above a top surface of the article. For this reason, amended independent Claim 91, and claims depending directly or indirectly therefrom, are further patentable over the art of record.

In the embodiment recited in independent Claim 98, the control system is conjoined with and movable with the robot. A first carriage is supported on the first guide rail and movable along a first axis. A second carriage is supported on the second guide rail and movable along a second axis. A first link mechanism is rotationally coupled to the first carriage at a third axis. A second link mechanism is rotationally coupled to the second carriage at a fourth axis. Notably, the third axis is located below the first axis, and the fourth axis is located below the second axis. A process tool mounting means is also supported at terminal ends of the first and second link mechanisms. The first and second guide rails are elevated above the article on opposite sides of the path and the six axes are parallel to the path. For these reasons, amended independent Claim 98, and claims depending directly or indirectly therefrom, are also patentable over the cited art.

In view of the present remarks and amendments, Applicants believe that the claims of record define patentable subject matter over the art of record. Accordingly, reconsideration of

the application and a formal Notice of Allowance are respectfully requested. If the Examiner believes that personal communication will expedite prosecution of this application, the Examiner is invited to telephone Applicants' undersigned representative at (419) 874-1100.

Respectfully submitted,

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